Gas Journal

VOL. 308 113th YEAR LONDON, NOVEMBER 22, 1961 No. 5125 PRICE 1/9

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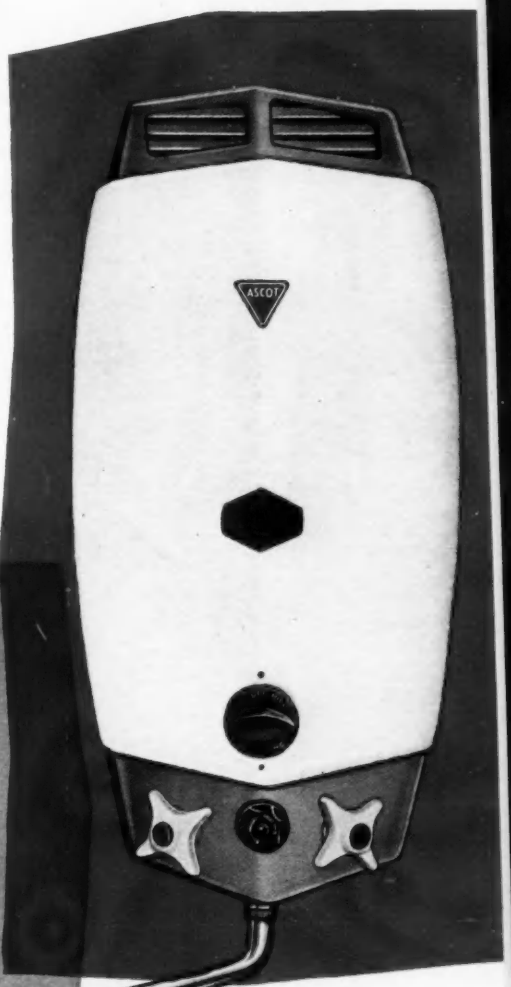

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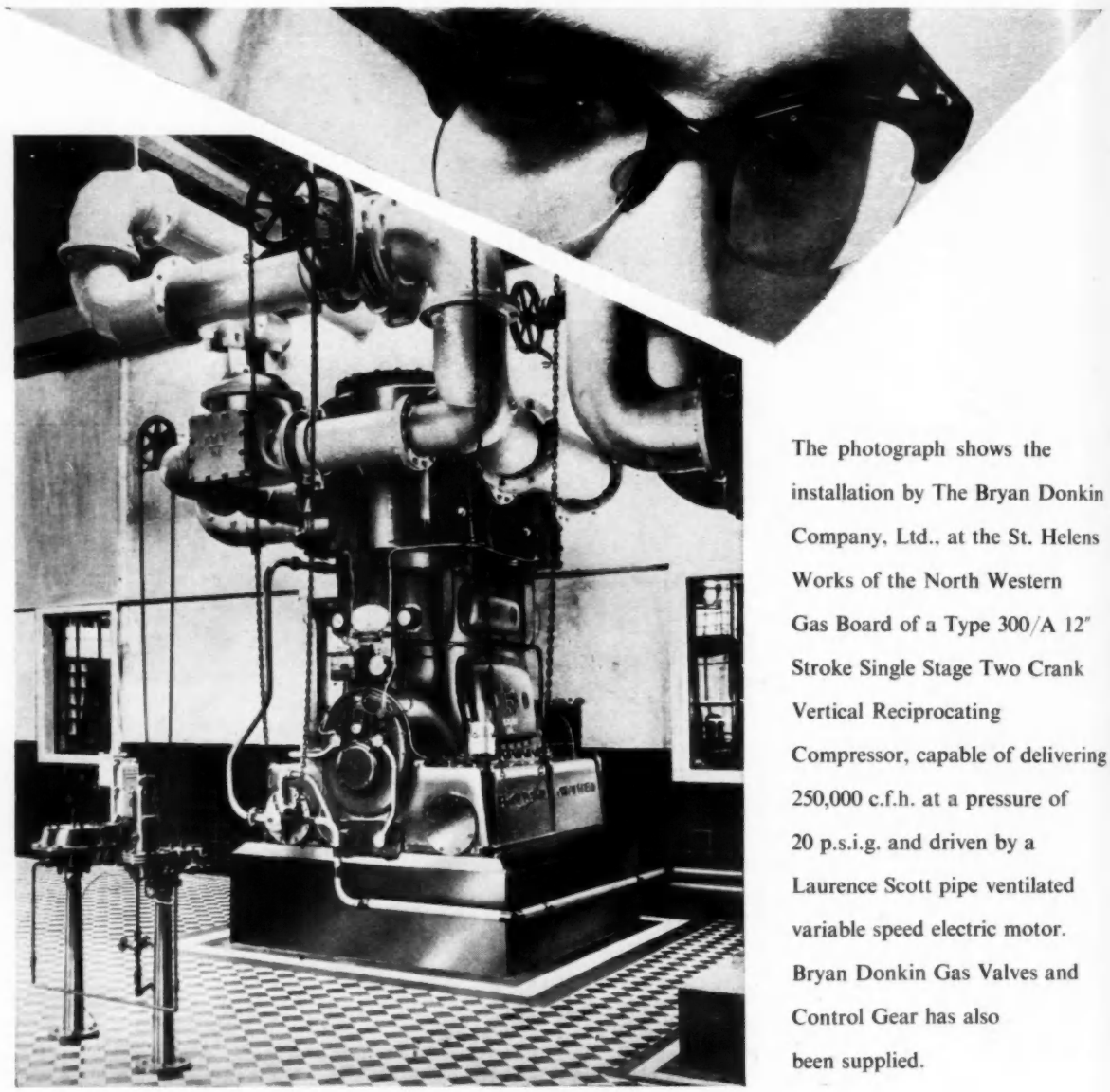

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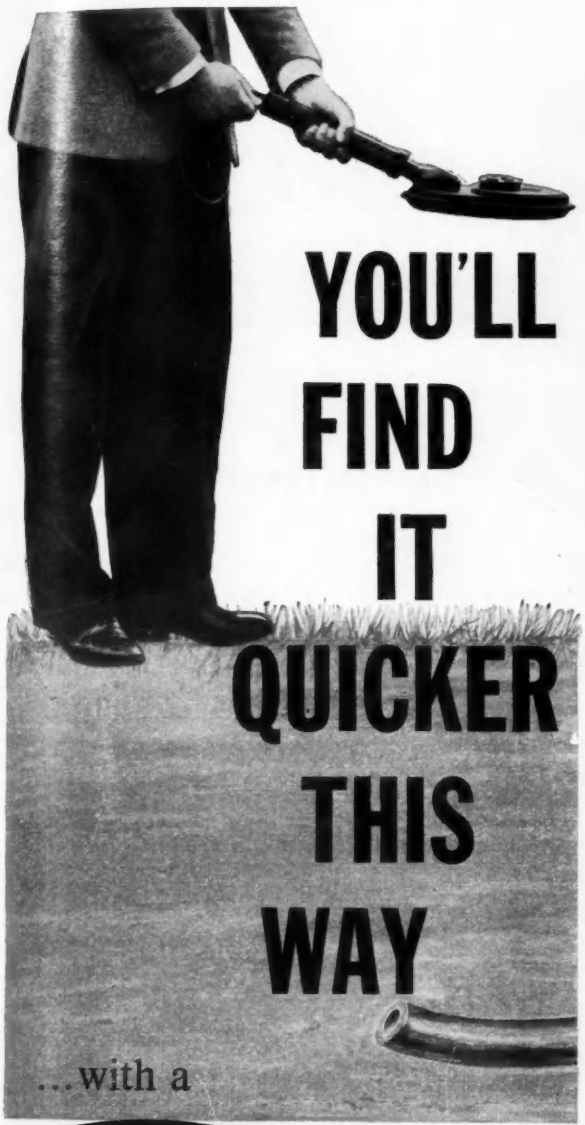

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Gas Journal

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WEDNESDAY, NOVEMBER 22, 1961

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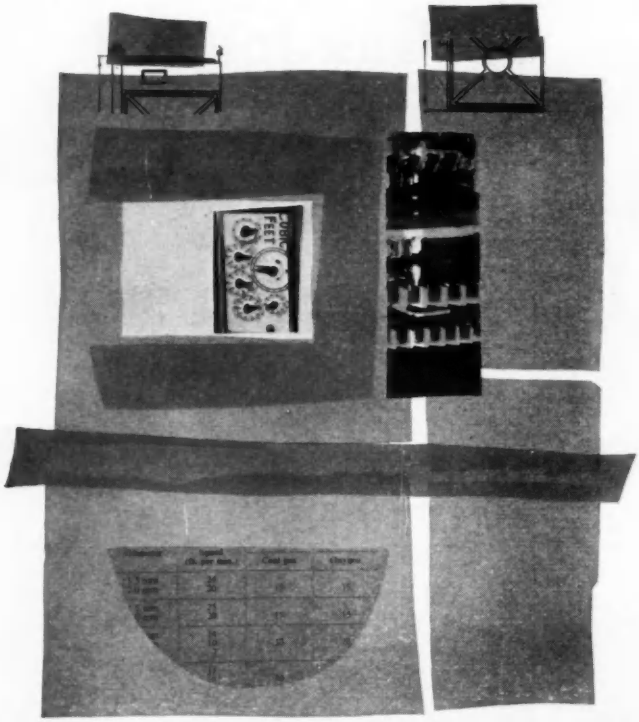

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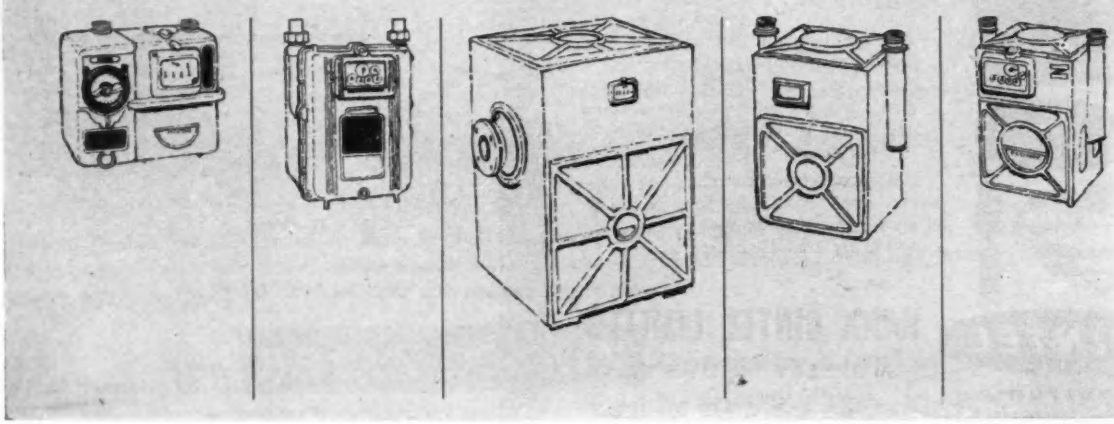

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Gas Journal

COKE OVENS • BY-PRODUCTS • CHEMICALS

Are new processes always acceptable?

IT is sometimes useful to look back on an outstandingly successful occasion when members of the Institution had the opportunity of making contact with their opposite numbers in the coking industry. Such was the joint meeting of the Institution, the Coke Oven Managers' Association and the British Coke Research Association, held recently in London. Our sister industry is clearly more interested in the working up of by-products from coal carbonisation than is the gas industry, outside the two main gas boards operating in the London area. Even so we feel that the paper we listened to on that occasion merits further attention, for the obvious keenness, and in some cases almost passionate partiality to a view, shown by some of the contributors, and for the author's adroit tactics, and sometimes his outspoken refusal to accept a point of view not completely borne out by his experience.

In his paper, an abstract of which we are publishing this week, Mr. J. B. Lane, Technical Managing Director of Lancashire Tar Distillers Ltd.—which processes tar produced by the North Western Gas Board—sets out the case for the hydrorefining process for the desulphurising of crude benzoles and naphthas. Even if this may be of limited interest to the gas engineer, the chemists in the industry showed by their contribution to the discussion that they had certain views to put forward.

We feel however that the paper is of considerable value in providing an example of the treatment and description of a new process with complete objectivity. Mr. Lane has been able to do this because the firms he is interested in use both types of purifying process, the acid-washing and the hydrorefining processes, the former in its most modern design. The main theme of the paper, therefore, emerges quite naturally as a comparison between the conventionally accepted, well-tried-method, brought up to date for the higher standards of purity demanded by buyers of top grade benzole, and the new, rather more sophisticated, process employing gaseous reduction of organic sulphur compounds to gaseous hydrogen sulphide, which can be more easily disposed of than the rather messy acid residues which result from the acid washing process.

In addition, the gum-forming and colour-producing contaminants present in the crude feedstocks are, it appears, more effectively removed by reduction to saturated hydrocarbons than they are by the older treatment with sulphuric acid at various strengths.

We have referred to Mr. Lane's credentials for comparing the two processes, and here we must stress that he may be said to have introduced the hydrorefining process on a commercially workable scale into this country from Germany. Although research and development work had been carried out in Britain from 1951 by the Coal Tar Research Association, and Newton Chambers & Co. Ltd. had built a pilot plant to process 500 gal. per day in 1957, based on the Association's findings, development in Germany was further advanced.

Commercial plants were available from Koppers of Essen and Lurgi of Frankfurt and the Lancashire Tar Distillers Ltd. ordered a plant from the latter in 1958. Later the Port Talbot Chemical Company, in which Mr. Lane is also interested, ordered a second plant, even before the full results from the first plant were available. We understand that these are the only plants so far installed in this country.

Though a pioneer, Mr. Lane is clearly not a fanatic, and we were struck by his impartial way of dealing with each process. Clearly, since the process is so new, Mr. Lane had to go into considerable detail to explain the working of the plant, whereas he was able to take all such details of the acid washing plant as being completely familiar to his audience. It is therefore with some regret that space does not permit us to include this important part of the paper in our abstract, but as we published an article on this particular subject last year in our series dealing with chemicals and by-products, we felt that its exclusion was not too great a loss.

As so often in the introduction of a new process, its cost may be higher than the established means employed, and unfortunately this is true up to a point for the hydrorefining process. There are, however, certain advantages stressed by the author, which may reduce the higher production costs. The first is undoubtedly the very much higher yield of purified product, an important point when the very high standard of purity now demanded is considered. Another valuable advantage is the stability of the product shown by the absence of discoloration over many months' exposure to strong daylight; the great reduction in noxious effluents is another valuable factor. However, Mr. Lane points out

that plant over a certain critical throughput can compete in production costs with the acid-washing process, and he refers to large plant of 10 mill. gal. per year capacity as being the obvious choice for hydrorefining. Such plant is favoured in America and on the Continent, but unfortunately in this country the small, more scattered units are more common. From actual calculations on a 4.8 mill. gal. a year unit, taken over a ten year period, additional revenue can be forecast from the hydrorefining plant over the older process, but the return on the money spent is not so attractive as that from acid washing.

This we feel is most unfortunate because from every other point of view, hydrorefining would appear to be a far superior process.

Cambridge MS plant

IN the last few weeks the new MS plant at Cambridge has been officially commissioned by the city's mayor, and has therefore come within the cognisance of the general public and, perhaps more important, of the Public Health Committee of the City Council. This we feel is particularly valuable since however advanced in design gas-making plant may be, the image of the gasworks in the public mind has not changed much in the last 60 years.

Today's trends in plant design and control have, as all in the industry know, kept well abreast of other more 'modern' industries, and the mid-20th century gas-making plants are highly developed chemical engineering achievements.

As new feedstocks become available, so there appears the realisation of solutions to problems which have worried gas engineers over the years. One of these is the production of peak load gas, which in the past has been very costly. Oil gasification and the reforming of refinery gases are taking their rightful place in base load gas production, and plants working on various feedstocks and with the very minimum of labour have appeared in the last few years. Among the latter is the MS plant at Cambridge which can be used for peak load gas production at reasonable cost, and is the outcome of the work of the French engineers, Stein and Roubaix, under the auspices of Gaz de France.

Its name MS, or Micro-Simplex, is a fair description of it, especially for the technically-minded visitor who will see in it the very embodiment of *multum in parvo*, but what is the impression on the more enquiring engineer wishing to go behind the scenes? He will see a very ingenious plant indeed, and we hope from the description we are publishing this week that our readers will share this view with us.

This type of plant will reform either refinery gas or light distillates, so where the latter feedstock is available, it can be very usefully employed as a ready means of peak load gas production, enriched, as at Cambridge, with l.p.g.

It may seem something of a paradox that the space occupied by the reforming plant is about a third of that taken by the necessary storage tanks for the feedstock and the enricher. These two particularly inflammable materials need to be stored under such stringent safety conditions that in addition to near isolation from other plant, adequate fire-fighting equipment is of paramount importance as well as provision for the cooling of the tanks in warm weather.

The first of three such plants to be built in Britain, the Cambridge plant should prove a solution of most of the problems associated with peak load gas,

BRIEFLY . . .

Literature lure

What a tremendous improvement has been effected in gas sales literature! Latest examples to reach us are two room heater booklets, produced by the Eastern and North Eastern Boards respectively. The first is in two colours and the second in four, but both succeed in giving gas heating a very desirable luxury look. Generous distribution of such literature, although costly, cannot fail to bring inquiries.

Swings and roundabouts

The latest figures of appliance sales (for the second quarter) give a striking illustration of the great upsurge of popularity of gas space heaters. An increase of 43% is a healthy sign, but we should not overlook the fact that water heater sales fell by 13%. On this showing the water heater market is in greater need of assistance than the cooker market which only showed a 1% drop.

Gas Industry Christian Fellowship

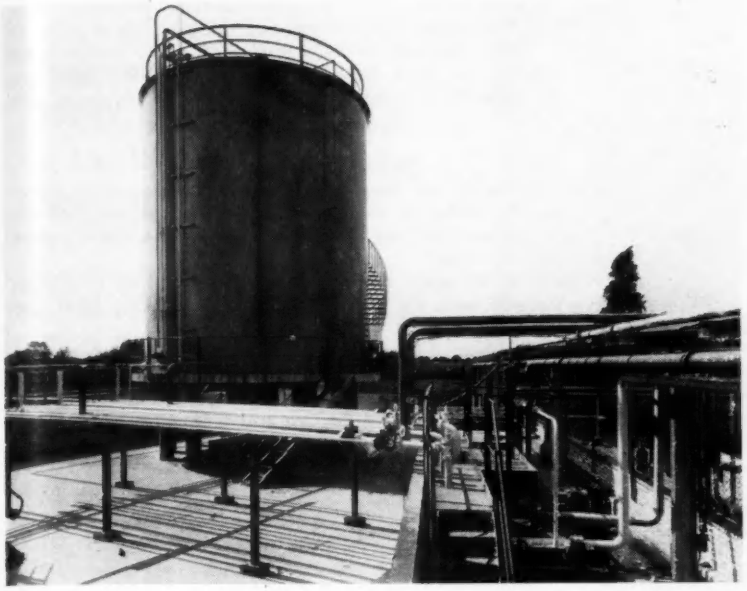
The Gas Industry Christian Fellowship is to hold its third annual public meeting on December 8, at Livingstone Hall, The Broadway, Westminster. Details are obtainable from Mr. J. H. Reeves, the General Secretary, at 13, Blanchmans Road, Warlingham, Surrey.

Advertising service

The British Gas Staff Association is loath to give up the suggestion, made at its last annual conference, that there should be a series of national advertisements emphasising the personal services available to gas consumers from the industry's trained staff. The idea is that these would personalise showroom staff, representatives and salesmen, home service advisers, foremen and fitters. The Gas Council regards this as soft selling and maintains that present circumstances demand a hard-selling policy. We are inclined to agree, but believe the B.G.S.A. suggestion is well worth bearing in mind.

Oodles of noodles

The exceptional suitability of gas for the method of cooking favoured by Chinese restaurateurs has long been regarded as one of our industry's more exotic connections. The simple, even crude, cookers with their double concentric burners are specially made. Until recently Chinese restaurants were more or less limited to London and some of our major ports. Now a mushroom growth of such establishments is evident all over the country. We have been reading in *Link-up* of the Sunrise, the newest and most luxurious of Warrington's five Chinese restaurants, which uses 6,000 therms a year.



One of the 90,000-gal. cylindrical storage tanks for p.f.d. standing in its own enclosure formed by the primary bund. In the space between it and the secondary bund are the pumps for delivering light distillate to the reforming plant. The necessary connecting pipe work for water and foam for the fire-fighting equipment can also be seen.

Cambridge MS plant—first of three in Britain—is completed

THE MS gas-making plant lately commissioned at Cambridge is the first of three such plants now being built in Great Britain to be completed; the other two are at Crewe and Norwich. Originally invented and developed by Stein and Roubaix of Paris, the MS—or Micro-Simplex plant—is built under licence in the British Commonwealth, Scandinavia, South Africa and Eire, by the Woodall-Duckham Construction Co. Ltd., the principal contractors of the Cambridge plant.

It is a cyclic reforming process equally suitable for either light petroleum distillate or refinery tail gases as its feedstock. It provides a means of producing a relatively cheap peak load gas since the capital cost of the plant is low and the feedstocks comparatively cheap. At Cambridge light petroleum distillate, p.f.d., is reformed followed by enrichment to the declared calorific value by l.p.g.

The Micro-Simplex plant has a number of unique characteristics which have not hitherto been applied to the cyclic reforming process, among which are the control of the cycle by the temperature of the reforming catalyst bed, rather than on a time basis, and the passing of all gases, both 'make' and 'blow' gases, through the waste heat boiler. The boiler itself is unusual in that it is designed for two passes of the gas.

Control of the cycle by temperature is undoubtedly a logical development, since the efficiency of the reforming process depends to such a large extent on the catalyst temperature. It might be argued, however, that unless the heat distribution thoughout the bed is uniform, little would be gained in efficiency if the process is controlled by the temperature of any section of it. The basis may be sound, but in fact how well can this temperature actually be regulated? The development of large plants from a small pilot plant might well run into difficulties, caused by problems of heat transfer thoughout the catalyst bed.

To avoid uneven heating, a tangential burner and an axial burner are employed at the top of the MS generator. Larger sized units have twin tangential burners.

The automatic operator works intermittently and is pyrometrically controlled, a predetermined maximum temperature of the catalyst causing a half revolution of the operator discs which changes the valve positions from 'heat' to 'make,' and a corresponding minimum catalyst temperature causing another half revolution of the operator for a return to the heating phase.

The Cambridge installation consists of two MS 32 reforming units each rated at 1.08 mill. cu.ft. per 24 hours, with the gas streams combining at the inlet of the secondary scrubber. During the heating phase, light petroleum distillate—p.f.d.—and air are burned above the catalyst bed, the combustion products passing downwards and so raising its temperature to the predetermined value, and thence through the waste heat boiler to atmosphere.

During the gas-making phase, p.f.d., steam and air in predetermined quantities enter the upper part of the generator, pass downwards through the catalyst, and the resultant gas flows to the relief holder through the waste heat boiler, the primary and secondary scrubbers, and the naphthalene washer.

At the inlet of the holder a controlled quantity of l.p.g. mixes with the reformed gas to effect cold enrich-

An overall view of the MS plant showing the control room on the extreme left and the reforming vessels in front of it. One Ruston & Hornsby waste heat boiler is seen at the base of the stack, with primary and secondary scrubbers between it and the relief holder, on the right of the photograph.

ment to the desired calorific value of 480 B.t.u. per cu.ft. The final gas, containing a very small proportion of sulphuretted hydrogen, is pumped by the plant's exhausters to the inlet of the dry purification plant where it meets the main works' unpurified gas stream.

Though the space occupied by the plant itself, including its wet purification ancillaries, is small for its capacity the safety precautions demanded when storing p.f.d. and l.p.g. in quantity have made it necessary to allot a relatively large area to storage tanks, which may well have taxed the ingenuity of those planning the plant layout in a comparatively confined space formerly occupied by an old horizontal retort house. Consequently the pipelines carrying the feedstock to the reforming plant are long and the tank area has been isolated in the north-western corner of the works.

The MS plant may be conveniently divided into three main sections, the control room, the gas-making plant and the wet purification plant.

The control room, located at the extreme south-western end of the plant, occupies the first floor of a brick building from which there is easy access to and from the plant. Here are to be found the two automatic operators and the whole of the instrumentation—a complete set for each unit—together with a cabinet containing the necessary electrical control equipment between the catalyst bed pyrometers and the operators.

Control room

The whole of the electrical equipment in the control room, including the automatic operators, which are based on a design by Stein and Roubaix, and all the instrumentation, was designed and manufactured by George Kent Ltd. in collaboration with the Woodall-Duckham Construction Co. Ltd.

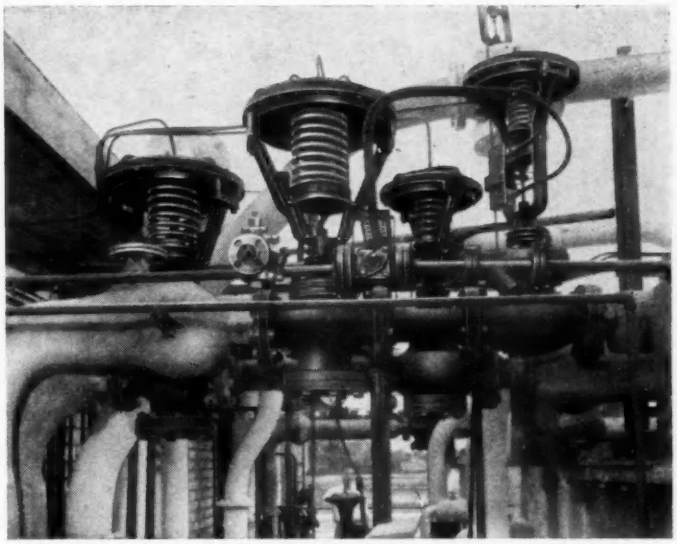
On the ground floor of this same building—which is sound-proofed—are installed the 'make' and 'heat' blowers—one for each set—two boiler feed-water pumps, and the air compressors including pressure storage drums set to 80 p.s.i. for the operation of the pneumatic cyclic valves. In addition to this plant, the micro-switches controlled by the cams of the automatic operator and operating the pneumatic valves through solenoids are mounted on the wall of this room. All the rest of the plant is installed in the open. The cyclic control valves have been supplied by Hunt & Mitton Ltd.

Inside the control room (left) can be seen the instrument panels and the automatic operators in duplicate, one for each reforming unit. On the left is the cabinet containing the electrical control gear for energising the two operators. A closer view of the operator shows the operating discs, the location diagram and the tell-tale lights showing the position of each valve. Plant production or standby is determined by push-button control.

Control Valves from HUNT & MITTON LTD. at the W-D/M.S. Reforming Plant at Cambridge.

Hunt & Mitton Limited extend their congratulations to the Woodall-Duckham Construction Co. Ltd. and the Eastern Gas Board on the opening of the M.S. Reforming Plant at Cambridge. Hunt & Mitton automatically operated control valves are controlling gas, superheated steam and propane. Those shown in the illustration are 3" cast steel direct acting valves with open/shut characteristic and reverse acting control valves with linear characteristic for superheated steam. Limit switches on the direct acting shut-off valves give a remote indication of the stem position.

Many similar valves were supplied, including large double seated valves for gas, and linear characterised etc. control valves with leak tight shut-off for light distillate.



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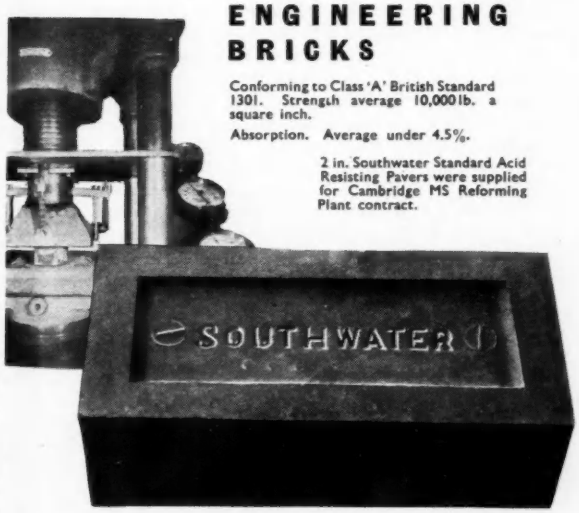

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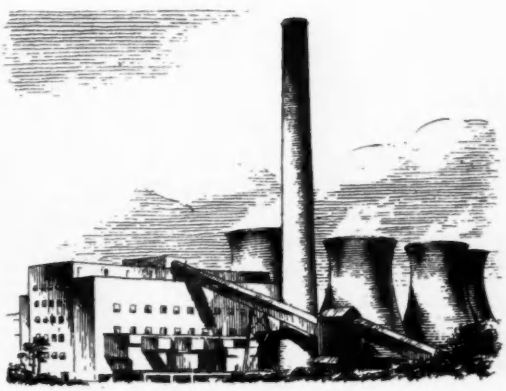

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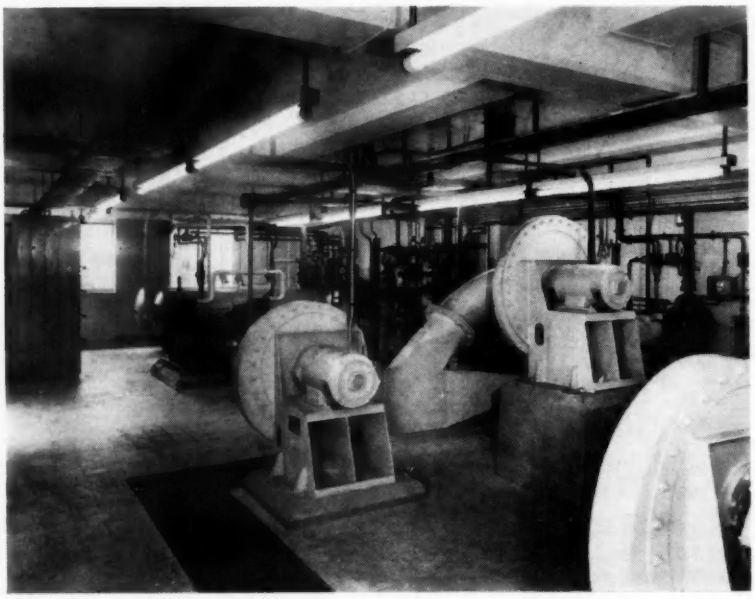


This view (left) of the blower-room beneath the control room shows the heat fan—to the left—and the make fan for one unit. In the background can be seen the compressors and compressed-air storage cylinders to supply the air to the pneumatically actuated cyclic plant valves. On the back wall are located the micro switches controlled by the automatic operator.

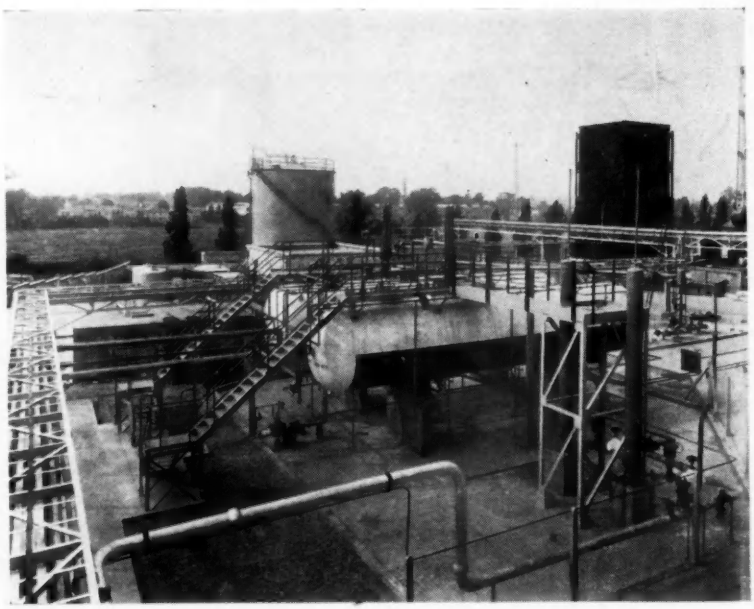
The heating cycle in which p.f.d. and air at 35 in. w.g. are burnt, continues until a temperature of 950-970°C. has been registered by the pyrometers in the catalyst bed, at which temperature the gas-making phase begins. When the temperature begins to drop below 950°C., the heating phase replaces the gas-making phase; the total cycle occupies about four minutes, about one-third of which is the gas-making phase.

The plant can be set 'on standby' by which the catalyst bed is maintained at a temperature of 850°C., by the heating phase being switched on and off as the temperature rises above or falls below this point. A return to gas-making is possible after only six cycles after resetting the operator.

During the gas-making phase air enters the generator at 72 in. w.g. and the quantities of steam and p.f.d. are controlled according to the performance of the generator. The carbon monoxide content of the gas is similar to that of coal gas.

The working of each unit is staggered to give as far as possible continuous gas production, and since the cycle is temperature controlled—not time controlled—it may be necessary to modify slightly the cycles to preserve the necessary interval.

This is achieved by an 'interlock' device between the two automatic operators, so that the independent make periods can be held back under special conditions for short periods to allow for smooth change overs from one unit to the other. Delays up to five seconds between cycles can be allowed for. Between each main phase there is a short steam purge period. From the generator the gas passes to a Ruston and Hornsby double-pass waste heat boiler in which is included a steam drier, and from there to the primary scrubber.



The fuel storage area, showing the two horizontal storage tanks for l.p.g. and, in the background, one of the vertically mounted tanks for storing p.f.d. In the right background is the cooling tower for washing water from the primary and secondary scrubbers. In the immediate foreground can be seen the two steam-heated vaporisers for l.p.g. treatment before it enters the enrichers.

The water from the secondary scrubber, at the entrance to which gas from the two reforming units mix, is pumped from the works bore hole and is the coolest water available.

At the primary scrubber the gas contains up to about 50 grains of naphthalene per 100 cu.ft., this has been reduced to 10 grains by the outlet of the secondary scrubber, and is finally reduced to .5 grains at the outlet of the naphthalene washer.

This latter is of the bubble-cap type in which the gas is finally washed by oil circulated through the washer. The spent oil is pumped to the works oil-fired boilers as fuel. All cast iron pipe work for the gas mains was supplied by the Staveley Iron and Chemical Co. Ltd.

Enrichment of the gas by l.p.g. takes place at the outlet of this washer, and is remotely controlled from the plant control room; the gas after being metered passes to the relief holder, which is of the column-guided type, manufactured by R. & J. Dempster Ltd., and is of 25,000 cu.ft. capacity.

From relief holder

The gas is drawn from the relief holder by two Holmes-Connersville exhausters (12 in. by 30 in.), one standby, each with a capacity of 3 mill. cu.ft. per day, and passes to the main purifier plant. The holder operates a butterfly valve to by-pass the exhausters, if necessary to prevent its content dropping below 25% of its capacity. The red pavers used in the control room were supplied by the Sussex and Dorking United Brick Cos. Ltd.

Effluents from the scrubbers flow to individual compartments of the reinforced concrete separating tank. That from the secondary scrubber passes through a separator compartment for the removal of entrained naphthalene and tar if any should be produced, and mixes with the primary scrubber effluent to pass through a natural draught effluent cooling tower supplied by Davenport Engineering Co. Ltd. and return to the primary scrubber.

At the base of the cooling tower a probe operating a solenoid valve, allows water to bleed off to the sewer. Make-up water to the circuit is obtained from the works bore-hole as it enters the secondary scrubber. The necessary cast iron water pipes were supplied by Stanton Ironworks Co. Ltd.

The design and construction of the storage plant for l.p.g. and p.f.d. are without doubt a most notable feature of this plant. This section occupies a far greater area than the reforming plant itself, and the need to allow a distance of at least 50 ft. between the p.f.d. storage tanks and any other plant or building has meant that a whole corner of the works has had to be given over to fuel storage.

The l.p.g., consisting of a mixture of butane and propane (80-85% butane and 20-25% propane) is stored in two horizontally mounted cylindrical tanks, supplied by Clayton, Son & Co. Ltd., and fitted with specially designed hemi-ellipsoidal ends, and capable of holding a total of 40 tons of liquefied gas. The tanks are earthed and every precaution has been taken against fire. Up-to-date fire fighting equipment has been provided.

Mather & Platt Protecto-Spray temperature control equipment has been installed by which the tanks can be sprayed with water in hot weather to avoid an excessive internal tank pressure.

The sprays can be controlled in two stages; a hand control for use in hot summer weather by which 350 gal. per minute may be sprayed on the tanks, and an overriding automatic control operating sprays at 700 gal. per minute for use in the event of an excessive temperature rise as a fire prevention precaution. This operates if the ambient temperature reaches 140°F.

Other ancillary plant consists of a totally enclosed Shand & Jurs contents level indicator, and four safety valves grouped together on each tank, so designed that any one of them can be isolated for examination and maintenance independently of the other three.

The l.p.g. is vaporised in duplicate steam heated vaporisers and enters a primary governor at 50-60 p.s.i. which reduces its pressure to 20 p.s.i. A secondary governor reduces the pressure to 6 in. w.g. The gas is metered by a 4-in. by 12-in. Holmes-Connersville meter, and its rate of flow for enrichment is controlled manually from the central control room in accordance with the reading of the Sigma calorific value recorder. The hydrostatic relief valves in the pipeline have been supplied by L.P. Gas Equipment Ltd.

The compound containing the tanks is surrounded by a chain-link fence, and unloading of both l.p.g. and p.f.d. from road tankers, takes place in a similar compound adjacent to both storages. A 4,000-gal. tanker can be unloaded in 30-40 minutes. Precautions are taken against the accidental spilling of either liquefied gas or distillate during unloading.

The p.f.d. for the reforming plant is stored in two vertically mounted cylindrical storage tanks, each with a capacity of 90,000 gal., and built on a reinforced concrete platform standing on columns of the same material to ensure flooded pump suctions.

The tanks are surrounded by a primary and secondary bund and a chain wire fence. The primary bund has a capacity of some 120% of the capacity of the tanks, and the secondary contains the pumps for transporting the distillate to the reforming plant. Both tanks are fitted with Shand & Jurs level indicators, and are earthed.

The space above the liquid in each tank is connected through a seal pot in the crown—blowing at 20 in. w.g.—to a source of town gas maintained at 12 in. w.g.

The most all-embracing fire fighting equipment has been installed by which water sprays on the top of each tank can be used for cooling, and foam pouring equipment located inside each tank allows foam to enter at two points at the top of the tank diametrically opposite each other.

Additional fire-fighting points are provided outside the secondary bund to which can be fitted portable foam-making machines. The flow of distillate to the reforming plant can be shut off by emergency valves in the delivery line, operated pneumatically from the control room and also from the storage area; the latter provide an overriding control and act as the 'master' set.

New pump house

Nitrogen stored in bottles, standing on the outside of the secondary bund, is available as a purge gas for all distillate lines.

In a new pump house, built just inside the works, have been installed the necessary pumps which consist of: A Mather & Platt centrifugal pump serving the Protecto-Spray system, fitted with an automatic starter which comes into action on demand—deluge sprays start up automatically, cooling sprays are started by the attendant—a Mather & Platt centrifugal pump for cooling water and fire-fighting foam for the p.f.d. tanks, and finally two raw water pumps—one stand by—supplying water for general works purposes. Each pump has duplicate suctions to assist in maintenance work, and all are cathodically protected. To avoid so many suctions entering the river Cam, two penstock chambers have been constructed in the roadway of the towpath, and one suction from each pump is connected to each chamber.

From a paper presented at a joint meeting of the Institution of Gas Engineers, the Coke Oven Managers Association and the British Coke Research Association, London, November 1.

Hydrorefining in the processing of naphthas and crude benzoles

By J. B. LANE,
TECHNICAL MANAGING DIRECTOR, LANCASHIRE TAR DISTILLERS, LTD.

HYDROREFINING both of vertical tar naphthas and coke oven benzole, is a fully developed process which can be turned into a reliable plant operation. It is no more difficult to operate the hydrorefining process than acid washing.

There are no difficulties in producing pure benzene in high yields by distillation of a hydrorefined coke oven crude benzole. The two main advantages of hydrorefining, against acid washing, are quality and high yield.

There is no effluent problem with hydrorefining. Hydrorefining tar naphthas in cost per gallon of feed is more expensive than acid washing, but if related to the cost per gallon of water white solvents recovered it is about the same.

Prime costs of acid washing coke oven crude benzole to No. 2 pure benzole specifications are about the same or marginally lower than hydrorefining, but the capital cost and, thus, depreciation charge on hydrorefining is greater.

Realisation of products

The overall realisation of products less working costs for a tar naphtha by hydrorefining is 1.5d. to 3.9d. per gal. better than acid washing. The overall realisation of products less working costs for a coke oven benzole by hydrorefining is 1.5d. per gal. better than acid washing.

A pure benzole with a sulphur content less than 2 ppm., and perhaps less than ·5 ppm., can be achieved in the future, both by hydrorefining and acid washing, although only by additional cost in the case of acid washing.

Pure benzole with crystallising points above 5·4°C can also be achieved both by acid washing and hydrorefining in conjunction with this low sulphur content. However, with such low thiophen contents the depression of the freezing-point will be caused by the aliphatic impurities such that the composition of the original crude benzole will be the most important function. Although the modest conversion of benzene to cyclohexane will accentuate this problem by hydrorefining, with a normal coke oven crude benzole at least 85% of the benzene present in the crude can be recovered to this specification, the balance being to a lower crystallising-point pure benzole and motor benzole.

However, if hydrorefining were supplemented by solvent extraction or 'freeze' techniques, a minimum of 97% of the benzene present in the crude could be recovered to a specification with a minimum crystallising-point of 5·4°C.

Acid washing would also run into the same problem associated with aliphatic impurities of the crude benzole, and with the exception of crude benzoles with very low initial aliphatic content, it is not possible to recover more than 83% of the benzene present in the crude to a crystallising-point of 5·4°C without a further supplementary process.

Solvent extraction developments of a hydrorefined vertical tar naphtha could yield high quality aromatics and paraffins at least equal to anything available in the world today.

Hydrorefining has a greater advantage the greater the throughput. The advantages at 10 mill. gal. per year are greater than those quoted above, which are based on 6 mill. gal. per year for tar naphtha and 4·8 mill. gal. per year of coke oven crude benzole.

A fire completely destroyed the benzole refining plant at the Lancashire Tar Distillers, Ltd., works at Cadishead in May, 1956.

Visits were paid to Germany, where the author was shown the plant at Scholven Chemie and a plant built by Koppers at the factory of Matthias Stinners at Essen Karnap.

During a visit to the Lurgi laboratories at Frankfurt in October, 1956, the author came to the conclusion that hydrorefining techniques could be successfully operated on plant scale, and that the laboratory figures could be successfully achieved, using both hydrogen and coke oven gas on coke oven benzole. With the utmost help both from Lurgi and Koppers, the problems involved were resolved and an order was placed with Lurgi in May, 1958.

It was decided to use hydrogen rather than town gas, mainly because the pressure required to use town gas would have been of the order of 100 to 200 atmospheres, since the local gas supply had a hydrogen content of only 30 to 35%. Cylinder hydrogen to our requirements at 99·9% purity was available, and, although the price was not low, it did not necessitate additional capital expenditure on a hydrogen plant.

Few teething troubles

The plant was designed for 6 mill. gal. per year, the throughput consisting of a mixed feed of 40% crude gasworks benzole and 60% tar naphthas. The plant started up in June, 1959, and, thanks to Lurgi's starting-up team, we experienced few teething troubles. The only problem has been to find sufficient raw material to keep the plant going due to the present trend of non-extraction of crude benzole at the gasworks. The plant has been running at 60% of its design throughput, and, to fill the plant capacity,

we did buy some cracked petroleum feed, which gave considerable trouble in polymerisation and coke deposits. We have more than trebled our sales of refined tar naphthas since operating the plant.

In late 1958, the Lincolnshire Chemical Co., Ltd., was asked to move the site of its works to make way for further expansion of the Lysaghts Scunthorpe Works (branch of G.K.N. Steel Co., Ltd.), whose crude benzole it refines. It was decided that while moving the old plant, which had been substantially modernised since the second world war, the new plant would be brought completely up to date. However, there was in existence valuable modern acid washing plant and distillation plant, which could be re-used in the acid washing process.

Again the possibility of changing to hydrorefining was considered, but the facts of the case were different, so the decision was taken to modernise the acid washing to a 6 mill. gal. per year plant constructed by the A.P.V. Company, using first an efficient defronting stage followed by a highly efficient continuous plant on the crude benzole to give a close-cut unwashed benzole and an unwashed residue from the crude benzole. This step has never been regretted, and the Company's operations on the new plant, which started up in August, 1959, have been highly satisfactory.

Joint company

In March, 1959, this Company, which is associated with the Steel Company of Wales, formed a joint company, the Port Talbot Chemical Co., Ltd., to refine the crude benzole of the Steel Company of Wales, the plant design capacity being 4·8 mill. gal. per year.

Here the plant would be a new construction on virgin ground, and hydrorefining against acid washing became a clear-cut choice.

After consultation with Benzole Producers, Ltd., we decided to design the plant on a maximum yield of benzole with less than 5 ppm. sulphur, and a crystallising-point of 5·35°C. There was some chance that a benzole would be required to this specification in the not too distant future.

The decision on which type of plant to install depended on the relative ease of distilling hydrorefined benzole, as there was a possibility that any cyclohexane produced in the hydrorefining process would cause difficulties in the production of pure benzene.

Here, again, the Lurgi Company was able to prove that this was no real problem, and showed us a combined hydrorefining/pure benzole distillation plant that it had built for Dortmunder Bergbau at Dortmund. The Lurgi Company supplied also a process design for the distillation unit, which was constructed and engineered by R. and J. Dempster, Ltd., using Montz plates. During the Port Talbot plants' running period, the desired yields and costs were achieved, with sulphur contents as thiophen averaging about 1·5 ppm.

As to the future, the real benefit of hydrorefining of vertical retort tar naphthas at Cadishead can be fully achieved only when we have developed a system of getting an aromatic paraffin separation for the whole hydrorefined product. Work is well forward on this project, but much has still to be proved.

The acid washing process at Lincolnshire Chemical Company's works with its limit on yield, can be developed to give pure benzole below ·5 ppm., at a little additional cost, by a process developed by the Company itself, and which is well advanced.

At Port Talbot, it is confidently expected that conditions of hydrorefining can be changed to give benzene with sulphur below ·5 ppm., at a little extra cost, although, to give a crystallising-point of 5·45°C, it may be necessary to recover the benzole from the forerunnings by solvent or 'freeze' techniques, and would only be justified by a premium on this quality (or a discount on other qualities). However, the higher yield of products gives increasing advantage to hydrorefining over acid washing as the specification for pure benzene becomes tighter, provided the money can be found for the additional capital cost.

The author's opinion is, that the higher the throughput, the tighter the specification of products and the less modern equipment in existence, the more positive becomes the appeal of hydrorefining. The difficult decision is when the throughput is 6 mill. gal. per year, or less: Does one modernise with hydrorefining, or cut one's expenditure and modernise with acid washing? Both processes can give the quality demanded for the future. Perhaps the correct trend is for large centralised refineries of 10 mill. gal. per year, or greater, employing hydrorefining on the scale for which it was truly designed.

The Lurgi process of hydrorefining employs a molybdenum catalyst on an alumina base. Other hydrorefining processes (notably the C.T.R.A./Newton Chambers/Esso research) employ a cobalt-molybdenum catalyst. Both seem effective.

A cobalt-molybdenum catalyst gives a modestly better degree of desulphurisation and could lead to slightly lower reaction temperatures necessary at the catalyst. It is claimed that a molybdenum catalyst is more effective in giving lower bromine numbers of the hydrorefined product.

The catalyst employed at both Cadishead and Port Talbot is an extruded one, which tends to be more reactive per unit volume than a pelleted one, and gives sufficient physical strength.

With a cobalt-molybdenum operating in the range of 310° to 410°C, it shows that the efficiency of sulphur removal increases with temperature, but so also does the rate of catalyst deterioration when operating at atmospheric pressure.

Increase of the hydrogen pressure improves the desulphurisation and retards carbon build-up on the catalyst. This favours using as high a hydrogen partial pressure in the plant as possible without seriously beginning the conversion of aromatics.

Increased ratio

The gas ratio does not affect the desulphurisation markedly except that slight improvements can be effected by increasing the gas : crude ratio at higher temperatures.

As might be expected, the lowering of the liquid feed rate (*i.e.*, increasing the contact time) results in more complete removal of sulphur.

One of the hidden advantages of hydrorefining is lack of effluent problem. This is not the case with acid washing. The effluent from the Cadishead plant is of the order of 70 to 100 gal. per hour, and, at Port Talbot, 120 to 150 gal. per hour of a water which has been in contact with both hydrogen sulphide and ammonia. The Cadishead effluent contains about 4 g. per litre of ammonia and 3·3 g. per litre of hydrogen sulphide. The Port Talbot effluent contains considerably less ammonia (due to low pyridine bases in crude), and has less hydrogen sulphide.

In view of the comparatively high cost, it is important to ensure the minimum consumption of hydrogen, and, therefore, to limit to the minimum any unnecessary loss in the process. Since there are limited day-to-day variations in constitution of the crude feed on stream, demanding

varying amounts of process hydrogen supply be controlled by a self-adjusting system and that there should not be a direct quantitative control relating hydrogen flow to hydrogen demand.

The throughput of the plant is governed by the catalyst contact time required for the various reactions to reach the desired degree of completion, and the availability of hydrogen. So long as the hydrogen supply and capacity of catalyst are not exceeded, reasonable variations in the constitution of the feed are automatically adjusted while on stream.

The theoretical amount of hydrogen required can be calculated, and there are three potential losses: (a) Hydrogenation of aromatics; (b) hydrogen content of tail gas; and (c) plant losses through recirculation compressor.

To turn 1 lb. of benzene to cyclohexane takes 14 cu.ft. of hydrogen at N.T.P. This is not only an expensive, but a physically undesirable, side effect. By fixing the operating pressures and temperatures as low as possible to achieve satisfactory quality of raffinate, hydrogenation of aromatics is minimised. It is difficult, due to the complex composition of the feed, to assess the amount of hydrogenation going on, particularly as there is cyclohexane in the crude, which is also hydrogenated to cyclohexane.

Hydrogen consumption

Another method of assessment is to account for the expected hydrogen consumption of the feedstock, and to compare the figure with that actually found on the plant.

A careful preparation of the feed naphtha before hydrorefining is most important. The extraction of tar acids must be as complete as possible, not only because of their value, but because of their usage of hydrogen.

Close attention is also required to the naphthalene content of the feed. Fortunately, it is found that under our conditions naphthalene in the main is hydrogenated to tetralin, not to decalin, but represents 5% of our hydrogen usage. It is virtually impossible to eliminate the presence of naphthalene from the feedstock, but, by an efficient predistillation of tar naphthas, it is limited to about 2 to 3.5%. Another trouble with the hydrogenation of naphthalene is that the heat of reaction is low compared to other impurity removal.

The removal of the gaseous reaction products of hydrogenation relies on their solubility in the refined naphtha at the operating pressure of the plant in the seal pot which collects the liquid refined naphtha and releases the recycle gas to the recirculating compressor. The composition of the tail gas is determined by the relative solubilities of the various gases in the liquid hydrocarbon. Hydrogen sulphide is readily soluble, and is also the product we wish to remove, whereas hydrogen, which should not be removed at all, is the least soluble. Other light hydrocarbons are, naturally, the most soluble.

The heats of reaction of the two main reactions of hydrogenation (namely, conversion of thiophen and carbon disulphide to hydrogen sulphide and hydrogenation of the unsaturated compounds in the general range of tar naphthas) are sufficient to supply all the heat for the process and plant thermal losses.

The total heat required for evaporation is somewhat greater the higher the boiling-range within the range 80° to 190°C, but, usually, so is the bromine number.

The total heat available from the formation of hydrogen disulphide, methane and butane from hydrogenation of carbon disulphide and thiophen respectively, and the saturation of the double bond, calculated from bond energies would be about 180 B.t.u. per lb. of feedstock or about 1,500 B.t.u. per gal. Essentially, this is used to make up the radiation losses from the plant and the heat removed in the condenser. This heat has two main uses: (a) To preheat the gases to reaction temperatures, and (b) to evaporate the feed.

The main advantage of the hydrorefining process is its high yields of products. Losses in any benzole or naphtha rectification process are brought about by (a) physical loss of material shown by a material balance, and (b) the side effects of the rectification process, leading to losses of the higher-priced material.

The physical loss by hydrorefining is small, since the process is contained in a system which depends on an operational pressure of 28 atmospheres, such that leaks, which might otherwise escape notice, cannot be tolerated from a safety aspect. The losses involved in pressure letdown and hydrogen sulphide blow-out are also minimised by operating at the highest pressure and lowest temperatures, to keep the partial pressures of the recovered naphtha as low as possible, to keep the lowest concentration in the tail gas.

There is also a small drop in specific gravity of the hydrogenated products, which gives an apparent gain in volume over the process after allowance has been made for the removal of sulphur compounds.

The reactions taking place during hydrorefining are fairly clear cut.

The aromatics remain unchanged with the exception of some slight hydrogenation, and these hydrogenated aromatics (such as cyclohexane), although tricky to remove when pure benzole is the desired product, are recovered as motor spirit in the general boiling-range of the original feed.

The olefines are similarly saturated to the corresponding paraffins, which in general terms have somewhat lower boiling-points. There is, therefore, a general slight lowering of the boiling-range of the feedstock.

With the more conventional method of acid washing, one can expect the feed naphtha to have an increase in boiling range after treatment.

The carbon disulphide is taken off as a 'forerunnings,' usually with a larger quantity of light useful material; in our case, we should expect this to be a minimum of 2% of forerunnings, but in practice, because of the light nature of the feed naphtha, something nearer 4%. These forerunnings would have little value.

Sulphonation of aromatics

Sulphonation of the aromatics would also take place, but this is most probably in line with the degree of hydrogenation, but, whereas the hydrogenation product has motor spirit value, the sulphonation product has none. In acid washing, perhaps the greatest loss is due to the condensation and polymerisation reaction in the presence of sulphuric acid.

In a refined tar naphtha, the quality is gauged more by degree of saturation of unsaturated compounds than the degree of desulphurisation. Although the degree of desulphurisation is not outstandingly important, hydrorefining does reduce the sulphur content of the raffinate to below 1 ppm. Here the distilled final product of hydrogenation has a firm advantage.

All the products have only their aromatic smell, and the colour stability is such that, even standing in clear glass bottles, they have remained water white after two years' exposure to light.

The inherent nature of vertical retort tar naphtha is its aliphatic content. In general, this is in the range of 20 to 30%, and hydrorefining can do nothing to alter this fact.

At present, the refined naphtha from the hydrorefining plant is split into sales grades by traditional straight fractionation.

It is obviously desirable that some other method should be considered to achieve a further refinement of an aromatic stream and paraffinic stream. The three main problems are: (a) The high percentage of non-aromatics, (b) most solvents preferentially dissolve the aromatics, which are still the main constituent, and (c) that about half the material boils above xylene (150°C).

The third disadvantage is the most pressing as most world research and development is concentrated on raw material containing at least 85% in the benzole—toluene—xylene range (*i.e.*, boiling up to 160°C), thus, there has been no need for such a development. Secondly, the high-boiling nature of the feed causes difficulties due to the low boiling-point of the solvent, the instability at higher temperatures, or the low solubilities of the high-boiling aromatics in that solvent. This limits the scope of most of the known and developed solvent extraction processes, which deal with benzole, toluene and xylole only. Lurgi and Udex, to mention but two, have first-class processes in this range.

The Newton Chambers 'freeze' technique deals with the benzene fraction only. Here, again, it has been demonstrated that benzene of 5.4°C crystallising-point can be manufactured easily and economically, but as this represents only 20% of naphtha produced, it solves only the fringe of the problem.

The full advantage of superior quality cannot, therefore, be fully realised until the paraffin—aromatic separation can be achieved.

From the previous considerations, it will be seen that the main attraction of hydrorefining tar naphthas from vertical retort tar or benzole is in its yields and quality of products rather than in lower working costs.

The running cost, based on 6 mill. gal. per year of a typical tar naphtha with a sulphur content as carbon disulphide .4% w/v, and as thiophen .6%w/v, and a bromine No. (g./100 ml.) of 40, with a distillation range of 20% at 100°C, 50% at 160°C, and 92% at 190°C, would be about 5.9d. per gal. of crude. The total cost per gal. of sales grades recovered after processing would be approximately 9d. at a yield of 89%.

Taking the acid washing costs, including depreciation on a plant built at values of 10 years ago, it is estimated that the comparative working costs by acid washing would be 5.0d./gal. for best yield, and 5.5d./gal. for best quality.

Assuming a value of true and polymerisation residues at 9d. per gal. net, naked on the yields mentioned previously per gal. of feed naphtha, the corresponding figures for acid washing would be 7.1d. and 9.2d. respectively with yields of 70% and 60%.

The advantage from hydrorefining is, therefore, not only in the superior quality, but also in that higher yields of saleable naphtha more than balance the higher working costs. The advantage financially lies between 1.35d. per gal. to 3.95d./gal. for an altogether superior product, which, on 6 mill. gal. per year represents £33,750 to £98,750 per year. Assuming the distillation and storage is in existence and only the hydrorefining plant needs erecting at today's costs, an expenditure of approximately £300,000 is needed, giving a return on capital of 11 to 33%. This ignores any premium for the superior quality, which might take the form of a monetary premium or a physical premium of selling products of a superior quality at the same price, where terms of trade are weak.

BOOK REVIEWS

OCCUPATIONAL FIRST AID MANUAL

THE Second Edition of the St. John Ambulance Association's Occupational First Aid Manual is virtually a new publication. Designed to supplement the standard first aid training, it lays emphasis upon the hazards in industry and how best to deal with casualties which may arise at work, showing the design and equipment of first aid centres based on the latest developments in this field.

Factory accidents and loss of life have increased to the highest for ten years and the figure of 190,266 for 1960 is an increase of 9% over that for 1959. This book is a realistic attempt to minimise the effects of factory accidents.

Many factories have excellent medical reception centres, trained first aid teams and their own ambulances, and will no doubt welcome this book as a guide for their trained personnel. It can be of particular value to the managements of smaller factories who wish the men in charge of their first aid boxes to have a wider knowledge of their duties and responsibilities.

This book is very fully illustrated with diagrams and photographs. It covers a wide field from accident prevention to specific treatment of common injuries—chemicals in the eyes, emergencies and major accidents, a simple graphic chart for display on the factory floor giving immediate action in cases of shock, gassing, bleeding, failure of breathing, burns and moving casualties. A special section has been included for the first time to cover guidance in cases of illness rather than injury at work.

ST. JOHN AMBULANCE ASSOCIATION, STORES DEPT. ST. JOHN'S GATE, LONDON E.C.1. PRICE 4s. 6d.

COAL, ITS FORMATION AND CONSTITUTION

By Wilfred Francis

THIS is the second edition of the book by the same author published in 1954. It has been completely brought up to date by the study of the latest information available, and a new chapter has been added which deals with the evidence for an organised structure in coal, and the attempts to synthesise one from the information now at hand.

It is essentially, however, a book for the specialist and contains a mine of information which should be of particular interest to the student.

The rate at which the theory of coal technology is advancing may be gathered from the need to bring out a second edition on so abstruse a subject in the short space of seven years.

EDWARD ARNOLD (PUBLISHERS) LTD. PRICE 7 GNS.

THE BUILDING EXHIBITION

OLYMPIA LONDON, NOVEMBER 15-29

IMPERIAL CHEMICAL INDUSTRIES LTD. is showing copper sheet and strip for cladding, flashing and damp-courses, hot water cylinders and backboilers; copper, brass and bronze extrusions for architectural, electrical and general applications; Integron integral finned tubing for air conditioning, heating, cooling and refrigeration units. I.C.I. General Chemicals Division features corrosion-resistant paints based on Alloprene—I.C.I. chlorinated rubber.

STOTHERT & PITT LTD. is exhibiting concrete mixers, small to medium capacity, including non-tilting and tilting drum machines with hydraulic weigh gear and hydraulic transmission; a range of vibrating rollers, including hand and power propelled models, and trailer types, and a truck mixer.

G. A. HARVEY & CO. (LONDON) LTD. is displaying or illustrating the full range of Harvey products and services. These Harco products include zinc and copper roofing; chimneys and cowls in steel; gutters, pipes and fittings; galvanised tanks, cisterns and cylinders; calorifiers and indirect cylinders; domestic fuel storage tanks. Harco wirework, woven wire, and perforated metal is used throughout domestic and industrial fields, for window guards, machinery guards, radiator and pipe covers, screens for sifting and sorting, ornamental grilles, ventilator panels, partitioning, cloakroom fittings and lockers.

TURNERS ASBESTOS CEMENT CO. LTD. displays a very wide range of products, including numerous asbestos-cement panels, presented in a variety of colours and textures. A particularly interesting innovation is a range of panels finished to give a metallic appearance, known as Hammerglaze. The new Turnall asbestos L.D.R. panels, which represent a notable advance in the manufacture of high quality, low density and rigid asbestos boards with good fire protection and thermal insulation qualities, are shown. The extensive range of roofing and cladding products for both single skin and double skin application is illustrated, together with the relevant technical information.

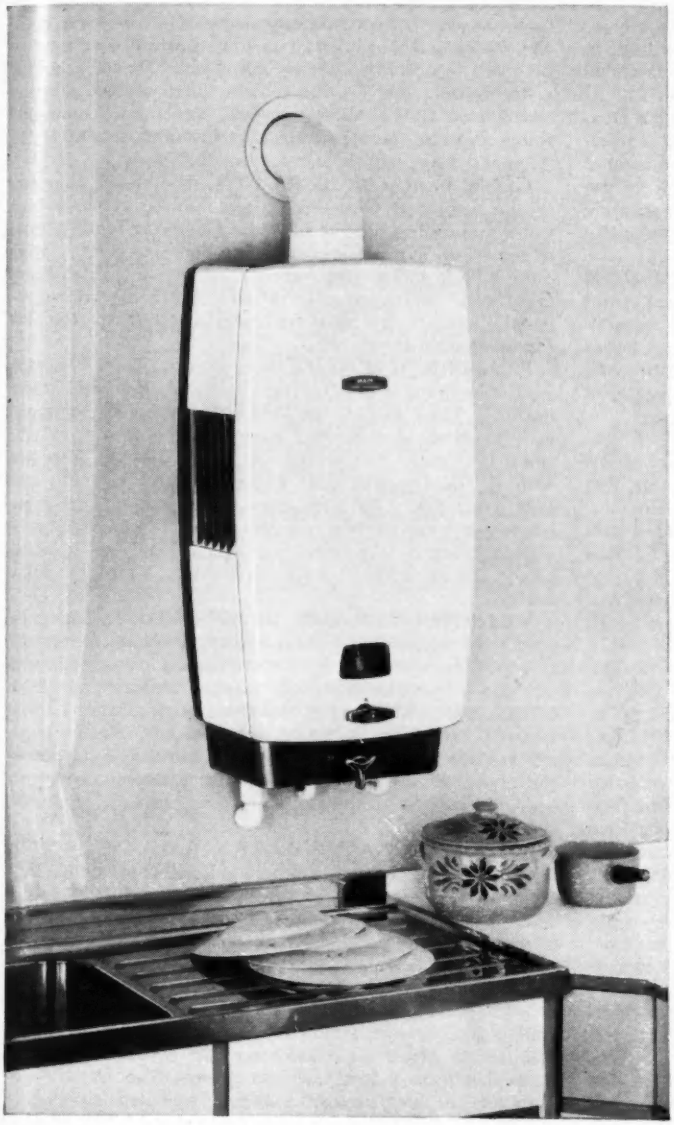
EVERED AND CO. LTD. is displaying an extensive range of products, and among those displayed are Surreyware metal and Everite plastics door furniture. The Circulatair ventilator, Isis laboratory fittings, and various tracks and sliders are shown with demonstration models. A special display panel gives an idea of the scope for using Everine polystyrene wall tiles.

WALKER CROSWELLER AND CO. LTD. is showing a Leonard 72 thermostatic mixing valve. This entirely new valve combines for the first time thermostatic control and flow control on a single spindle. The Leonard SB4 thermostatic mixing valve is a temperature controller for small-bore heating systems, designed to keep room temperatures even and steady, and pre-selected to the needs of the householder. The Leonard 2M thermostatic mixing valve is a restyled version of the Leonard Rada. Externally, the control knob is modernised. Internally, an O-ring replaces the conventional gland, and the thermostat has added power.

SAML. DENISON & SON LTD. is exhibiting a 150-ton Model TI.E portable compression testing machine, which has 240 v. single-phase 50-cycle electric motor-driven pump and three-speed load pacer. Specially designed to fulfil all the requirements of BSS. 1881 for 4-in. and 6-in. concrete cubes, and 6-in. by 12-in. concrete cylinders. A 200-ton Model TIB/MC compression and transverse testing machine, fitted with one 10-ton and two 200-ton load gauges, and load pacer, is also shown.

TRUE FLUE LTD., present an information and design centre. Technical representatives are available at all times and scale models of the following products are displayed: Triple units, flue linings. A model of the well-known throat unit is displayed and full information is available as to all types of flue linings and fittings. A model of the Type E.F. domestic external flue clearly demonstrates the adaptability of these precast sectional flues which have been primarily designed for use on existing property. They are well-insulated, efficient in operation and are cheaper to erect than the traditional brick stack. 'Shunt' flues and ventilating ducts are shown, and a scale model and full technical information is available on its use in multi-storey buildings. Drawings, photographs and a model of the SE-Duct gas flue are displayed.

HILMOR LTD. is showing hand-operated ratchet model and hydraulic portable machines to bend light gauge copper tube, electrical conduit and gas and steam tube. A particular feature of the exhibit is a new portable hydraulic bender which incorporates the patented Hilmor adjustable bending head. This machine is designed to bend up to 2-in. bore gas and steam conduit and differs from the conventional fixed head bender in that it permits the production of bends in varying planes with the minimum of straight tube between adjacent bends. Short



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W177

radius Mandrel benders for the production of full-bore bends cold and unfilled are exhibited together with a comprehensive display of bends in all classes of round tube, in square, oval and other forms of non-round tube, extended surface tube, angle and extrusions.

ALLIED IRONFOUNDERS LTD. is exhibiting a great variety of products. Among them may be found a selection from the current range of gas-fired boilers, and a range of Agavector warm air heaters—including a new wall model—for operation in domestic central heating systems. Gas cookers are represented by the colourful Leisure cooker.

IDEAL-STANDARD LTD. is exhibiting both Ideal heating equipment and Standard sanitary appliances. Ideal boilers shown include the Kingston gas boilers (some containing accelerators for small bore systems) and a larger Ideal Elite gas boiler. Both of these have fully automatic electric ignition control which eliminates the usual pilot flame. Also displayed is a range of Ideal radiators.

STANTON AND STAVELEY SALES LTD. has exhibits from the largest and most up-to-date foundry plants in Europe, including spun iron pipes, flexible joints and fittings for water, gas or sewage mains, and for other industrial purposes. Concrete products are represented by a specially-strengthened spun concrete pipe with Stanton Cornelius flexible joint as used in sewage and drainage schemes. Other products on view are foundry, basic and refined pig irons, chemicals, filter bed media, and steel rails and bars.

SUSSEX AND DORKING UNITED BRICK COMPANIES LTD. exhibit consists of a range of 80 different types of facing brick, which are set in two tall angular towers supporting an upstairs office enclosed by solar screens. Two shorter angle display fittings contain exhibits of glazed brick and moulded ceramic tiles. The flooring consists of various types of brick paving and flooring flags made within the Redland Group, which can be used together to form mixed patterns of brick and concrete paving for pedestrian areas.

THE GAS COUNCIL stand is an information centre on all aspects of gas utilisation in modern housing, community centres, schools, commercial premises, industrial canteens and places of entertainment. New developments in gas domestic central heating systems are portrayed by diagram and construction. They include small bore central heating, gas warmed air heating systems to give economical selective heating, or full warmth in all rooms. Cookers, sink heaters, refrigerators, clothes washers and boilers, and convector room heaters are also illustrated on this stand, as is the domestic use of coke.

POWELL DUFFRYN HEATING LTD. is exhibiting a wide range of products designed and manufactured to meet the space heating requirements of the building industry. This comprehensive range includes Janitor solid fuel, gas and oil-fired boilers, and Gulf hot-water, full window width, radiators. For industrial and commercial installations full details and specifications of the Dravo warm air heaters are shown. Worth noting for the smaller warm air installation is the new model 30 Dravo.

CANNON (GA) LTD. are showing the Cannon Super Chef Rotisserie grill with Kebab attachment as an independent unit for wall or cabinet fixing. In addition Cannon show the CannonLux—a joint production with Electrolux Ltd. CannonLux is the only combined, complete gas cooker and refrigerator. Also on show is GasMiser range of room heaters, incorporating the GasMiser room temperature control.

ASCOT GAS WATER HEATERS LTD. has as its main feature on the stand, the installation of an Ascot 727 multipoint and Radiation Parkray G.105 warm air heater fitted to a SE-Duct. The appliances are not operating, but full technical details are available on the stand. In addition to the Ascot 727, other multipoints on show include the 709, 905/1 and the 715 balanced flue heater. For the first time two new sink heaters are displayed. One is a boiling water heater type G.510 and the other a low pressure model type G.515. Both are fully governed on gas and water, and need no regulation after installation. The G.512 Ascot De Luxe sink heater is also displayed.

GLOW-WORM BOILERS LTD. is showing examples of the combined Glow-Worm and Sunrod range of hot water and central heating boilers. Gas firing is the feature of the Glow-Worm Thermglow and the Sunrod G5. High output back boilers are represented by a Glow-Worm Glowbrite. Fairly recently introduced are the Glow Line panel radiators and skirting heaters, and these, too, are represented on the stand.

F. A. BORCHARDT LTD. is showing several models from the range of DRUgasar balanced flue gas space heaters. These include the DRUgasar type JBN equipped with magneto ignition and flame protection control; the small DRUgasar 650, which can now also be supplied with a closed guard for domestic purposes; and the DRUgasar type GW with glow plate ignition and flame protection control. Various control valves and flame protection controls are demonstrated as well as a model illustrating the application of thermostatic control to these heaters.

METROPOLITAN GAS METERS LTD. features gas-fired convection heaters for domestic and commercial premises, manufactured by a Canadian company with over 100 years' experience in the warm air heating field. Models displayed are of the conventional or balanced flue types, suitable for the heating of houses, flats, shops, offices, waiting rooms. All these appliances incorporate the Honeywell Adatrol valve and thermostat control, to hold the desired temperature and provide safe, economical operation.

INTERNATIONAL BOILERS & RADIATORS LTD. features a wide range of gas boilers together with ancillary equipment for small bore central heating systems. One example is the Super 45 boiler, manufactured as a fully packaged unit, incorporating a balanced flue, thus ensuring complete combustion and eliminating all possibilities of fumes or smell in the kitchen. All other boilers are available as packaged units and can also be supplied with a unique zoning device, which reduces running costs as it allows the user to divide his installation into two areas each to be heated independently of the other. Also on show is the range of pressed steel radiators.

CRANE LTD. is exhibiting skirting heating panels. Cut sections of the three types of panel, 6-in. radiant, 9-in. radiant and the 9-in. radiant/convector are shown, illustrating the single waterway through the panel. Pall Mall radiators, hospital radiators, and wall radiators are shown with all the necessary radiator valves and unions. A selection from the Crane range of bronze and cast iron valves and malleable iron pipe fittings is also to be seen.

RADIATION PARKRAY LTD. is demonstrating two units providing selective central heating for smaller houses and flats. The compact gas-fired Ductair G.105/23 cabinet space heater is shown in association with an Ascot multipoint instantaneous water heater as a typical SE-Duct installation in a multi-storey block of flats. Conventional and balanced flue models are also available. Ductair 22, providing selective central heating and hot water, is demonstrated connected to the Parkray C.70 gas boiler. Three compact wall-mounted small bore central heating units are also shown.

THE VALOR CO. LTD. includes in its display working models of gas- and oil-fired domestic boilers and pressed steel radiators.

EVODE LTD. shows the respective uses of the products of the Company's speciality divisions. Here can be seen water-proofers, sealing compounds, and industrial flooring. The latter is a new product which is jointless, abrasion-resistant and hard-wearing, yet easily laid and inexpensive. Also shown are the more well-established materials of the Company's range.

D. ANDERSON & SON LTD. is displaying five main products. Andek is designed for roofing spans up to 12 ft. and 15 ft. using multi-span. Good insulation reduces possibility of roof movement. 'E' decking is aluminium trough decking for spans up to 10 ft. Positive top fixing by hammer drive screws provides good anchorage and clean lines of purlins. Dry construction and top fixing ensures speedy erection. Pyrodek is gypsum concrete roof construction which has high fireproof qualities combined with high-speed installation. This roof has been awarded a 2-hour fire rating by the Fire Research Organisation. Thermovent is a system of laying built-up roofing providing a ventilated waterproofing system which permits drying out of the moisture from lightweight concrete screeds. 'C' decking combines bars and interlocking deck plates of galvanised sheet steel, thermal insulation and built-up weather-proofing. The well-known Red Hand range of roofing and underslating felts and damp-proof courses is prominently displayed.

KAY & CO. (ENGINEERS) LTD. are exhibiting Kontite gunmetal underground fittings Type B for use on water services above and below ground, Kontite gunmetal polythene fittings for water services above and below ground, gunmetal soil pipe fittings for waste services, gunmetal screwed liner fittings for special industrial applications, heating systems, gunmetal waste pipe fittings and traps for waste pipe services.

PERKINS BOILERS LTD. has the Perkins Mini boiler as the main exhibit of a range of domestic heating appliances which are to be found on the stand.

BRITISH PAINTS LTD. is showing a wide variety of materials, which include a range of high opacity paints designed to reduce the cost of housing maintenance; materials for the protection of structural steelwork and the latest developments in two-pack materials including Luxol polyurethane coatings—prepared for a variety of applications. These coatings may be either brushed or sprayed to give an exceptionally hard yet flexible finish. Epilux 5 is a two-part material with excellent water and chemical resisting properties designed for brush application and recommended for the protection of structural steelwork and pipelines where severe marine atmospheres and industrial corrosive conditions prevail. It is based on coal tar pitch and epoxy resin.

THOMAS POTTERTON LTD. is showing a representative selection of boilers specially designed for domestic use. Included among them are the newly designed Diplomat gas-fired boilers and small bore units, incorporating the unique Potterton electric clock and programming selector switch.

RADIATION NEW WORLD LTD. has a display which covers water and space heating, cooking and refrigeration. A special section deals with the SE-Duct and balanced flue applications of New World water heaters. Individual appliances displayed are the Rado-Vecta gas room heater, the 460 convector, and New World Sunbeam gas room heater. Water heaters on show include the ST12 Stratalyn, the S30 Speedlyn, and the balanced flue Circulyn. New World gas cookers shown include the New World Seventy Two, the New World Forty One. The New World 200 gas refrigerator is also exhibited.

NEWTON, CHAMBERS & CO. LTD. is displaying the Redfyre No. 5 Bacboiler complete with Hearth Redfyre. This unit is shown providing background heating by means of four radiators, and in addition the system provides for domestic hot water and a heated towel rail. There are other Redfyre Bacboilers complete with the Redfyre '55' and '60' continuous burning fires. The complete colour range of the Redfyre '55' and '60' continuous burning fires is displayed.

JAMES STOTT & CO. (ENGINEERS) LTD. is demonstrating its kitchen planning service, which is freely available to architects, consulting engineers and builders. On the stand is shown typical examples of the detail service plans Stotts supply to architects, giving full information on steam, gas, water, electrical, waste and ventilation services and their location, together with all the technical information required to ensure a completely satisfactory installation.

ELECTROLUX LTD. is featuring the widest range of built-in refrigerators now available in Britain—the new M.40, the popular MB.16 and the well-known M.27. The M.27 is available in white or cream for gas or electric operation. The MB.16 is available in white or cream for gas or electric operation, and the cabinet can be supplied with a left-or right-hand door and is fitted with detachable ventilators at the top and bottom.

R. A. LISTER & CO. LTD. is exhibiting a representative selection of Lister engines and generating sets. Sectioned demonstration engines are included, also samples of accessory equipment. Examples of water-cooled engines are shown, taken from the Lister and Blackstone range. These engines are also shown with a selection of the wide range of accessories available. Also displayed are water pumps, generating equipment (including portable sets for the builder and contractor), a diesel truck and a mobile power loader.

DONALD MACPHERSON GROUP OF COMPANIES include a specific section devoted to industrial decorative finishing systems, with particular emphasis on the gas industry. The colour scheme and specification departments of the Group are also given prominence.

HYMATIC ENGINEERING CO. LTD. is showing Hydrovane mobile and portable air compressors covering all requirements of builders and contractors. Electrically-driven Hydrovanes are demonstrated in operation, including the new model 90E100, which powers four light pneumatic hammer drills or one heavy concrete breaker yet can be moved with ease around buildings under construction. These compressors are vibration-free, completely air-cooled and extremely quiet in operation.

THE RAWLPLUG CO. LTD. is showing light, cavity, and heavy fixings, hand-drilling tools and power tools. All these devices and tools are demonstrated on the stand by technical representatives.

YORKSHIRE IMPERIAL METALS LTD. is exhibiting Yorkshire Imperial Kite-marked copper building service tubes, Kuterlon copper tubes in lengthy coils for underground water pipelines and radiant panel heating installations, Kuterlex polythene and p.v.c.-covered copper tubes for gas and water service pipelines installed in aggressive surroundings, Yorkshire capillary fittings in copper, stopcocks, valves, clips and brackets, Polystantor compression fittings for jointing polythene tube, Yorcalloy fittings in copper, Yorcalbro (aluminium-brass) and Kunifer 10 for large industrial pipelines. A working system involving five different radiators, demonstrates Yorkshire Imperial copper tubes and Yorkshire capillary fittings for small bore forced-circulation central heating systems.

NEWS SUPPLEMENT

NEW PROCESS FOR STORING LIQUID GASES

A NEW 'frozen earth' process for storing liquid gases in a covered hole in the ground, at temperatures of −258° F. was demonstrated at Lake Charles, La., U.S.A., recently by Conch Methane Services Ltd., of London, and Constock-Pritchard Liquefaction Corporation, of Kansas City, says *Chemical Trade Journal and Chemical Engineer.*

The process involves freezing the ground surrounding the area to be excavated, excavating the hole, and then installing a vapour-tight-sealed aluminium roof over the hole before filling.

At Lake Charles's test site, the ground was pre-frozen by circulating a refrigerant through a circle of pipes buried 30 ft. deep.

Methane—Minister of Power replies to M.P.s' questions

THE Minister of Power, Mr. Richard Wood, recently faced several questions in the House of Commons concerning his decision to allow the importation of liquid methane from the Sahara.

He was asked if he was aware that the first year's gas imports would bring into the country the equivalent of 800,000 tons of coal.

Mr. Wood replied that the displacement of coal depended on the likely demand for gas in the future, and if methane had not displaced that amount of coal, he would probably have been asked to agree to other imports of oil-based feedstock, so that the position would have been much the same.

The Minister was then asked whether it would not be worthwhile investigating the possibility of importation of supplies of natural gas from Holland. The Council of Europe, in its last report, had stated that there were large reserves of natural gas in Holland.

Mr. Wood replied that these possibilities ought to be explored very closely indeed. 'I am told that the possibility of gas being available from Holland in the near future for this country is not certain enough to justify me in turning down the concrete proposals I accepted last week,' he said.

Referring to Lurgi development, Mr. Wood said that the decision did not in any way compromise the Lurgi development. If Lurgi was shown to be economic, it would go forward just as if the methane proposals had not been approved. The methane proposals, he believed, would help the Lurgi cases because the gas for enriching would then be readily available.

The next question referred to 'widespread disquiet in the coal mining industry' that the Gas Council intended to dispose of the Lurgi process and concentrate on importing methane gas, and asked for an assurance that this was not so, and that the Gas Council would proceed with the Lurgi process.

'I cannot give that definite assurance without knowing the facts which the Lurgi Study Group will disclose,' replied the Minister. 'I do not think that any of us would want the Gas Council to go forward with a Lurgi plant if the plant was not competitive.'

Asked when the Study Group would be likely to submit its report, Mr. Wood said that he imagined it would not sit for a great deal longer. On the other hand he did not think it would report quite as early as some people seemed to expect, because it still had a great deal of work to do.

SUGG PROFITS 'BEST EVER'

THE business of William Sugg & Co., Ltd., has undergone many changes in the last decade.

Faced with a steadily declining market for its original product—gas street lighting equipment—and a cessation of Government armament contracts the group has had to adapt itself to new products and techniques, says *The Financial Times.*

To-day the business is largely engaged in making space heating appliances.

The latest profits are the best ever, exceeding the previous peak—£137,600 of 1953-54—by a good margin. The current dividend rate—up five points at 27½%—also compares favourably with the 17½% of 1953-54, and goes some way towards compensating for the lean years 1956-58.

Tanker design will make full use of shipyard facilities

THE placing of the order for one of the two special tankers required for the liquid methane project with the Vickers-Armstrongs (Shipbuilders), Ltd., yard at Barrow-in-Furness brings into the north-west Lancashire town a contract highly desirable, bearing in mind the rather limited outfit work associated with some of the current contracts.

The contract involves the fabrication of large special quality aluminium tanks capable of operating at extremely low temperatures and requiring special welding techniques, and here the experience gained on high-quality work, particularly associated with the aluminium superstructure of Oriana and current submarine programmes, will form a good background for these operations.

INVESTIGATIONS

Not only is the structure of unusual form, with all its associated pipe services which will involve specialised welding on many non-ferrous materials, but the main machinery and auxiliaries will also be different from normal practice.

Following the early stages of discussion, the Company has carried out certain basic investigations with regard to methods of insulation and welding procedures for the aluminium alloy, as a background to the work now to be undertaken.

The insulation of the tanks represents a very special feature and the work involved will occupy a labour force many times that normally associated with a tanker of equivalent size.

The recently opened new welding centre in the shipyard, under the control of five skilled instructors and capable of handling, at any one time, 50 welders on the more advanced training techniques necessary for this specialised welding, originally developed for nuclear work, will be most appropriate for dealing with this new type of ship.

Fuel—by vending machine

This is the Pikrose Fuel-O-Matic vending machine, which sells fuel in pre-packed bags containing 14 lb. or 28 lb.

AUTOMATIC fuel vending machines, new to this country, are going into use in various parts of the north-west.

Finished in an attractive sky blue colour, the machines are clad in plastic-coated steel and offer pre-packed fuel in bags of 14 lb. or 28 lb.

Manufactured by the colliery engineering firm of Austin Hopkinson & Co. Ltd., of Audenshaw, Lancashire, the Pikrose Fuel-O-Matic has already attracted the interest of the National Coal Board, and other coal distributors, who foresee a big future for it sited on housing estates, near blocks of flats, on coal merchants' premises and as an addition to the services offered by supermarkets.

CARRIES 50 PACKS

Each machine can carry 50 packs and check-weighs every bag before delivering it to the customer.

The first experimental model of the Fuel-O-Matic was clad in aluminium, but Mr. Austin Voorsanger, Chairman and Managing Director of Austin Hopkinson, said: 'We found it was not a suitable material for external use—penknives could damage it. We needed something that would stand up to the rough treatment which an automatic machine often receives.'

Looking for a cladding to meet his requirements, Mr. Voorsanger decided on Stelvetite, plastic-coated sheet steel made by John Summers & Sons Ltd., of Shotton, near Chester.

Wilson-Radiant Heating: More rationalisation

HEATING engineers and particularly those connected with the gas industry, will read with interest how George Wilson Gas Meters Ltd., have converted a loss in the years 1957, 1958, and 1959 into a small profit in 1960 and a substantial profit in 1961.

The present board of directors of the parent company, George Wilson Gas Meters Ltd., consisting of Mr. W. D. Wilson, Mr. G. E. Withers and Mr. R. B. Reynolds, with the part-time collaboration of Mr. W. Compton-Carr, M.P., has taken decisions leading to a three-year plan. Streamlined production was achieved by closing down branches at Manchester, Glasgow, Cardiff and Wolverhampton.

Three factories existing at Jarrow were reorganised, two of them were disposed of, and a fully efficient production unit supplying components for assembly at Coventry was established in the third.

The Radiant Heating factory at Barnsbury Park, London, was closed down and is now established on a site adjacent to the parent company in Coventry with ample room for further expansion. Flowline production of overhead heaters and catering equipment is being maintained at Jarrow.

The head offices of both companies are now established at Coventry with regional sales offices in London and Jarrow. The directors, who have over the period been largely concerned with the rationalisation programme, are confident that the new management team and the new redeployment of the companies' resources of capital, plant and labour will enable it to play a very important part in the future of the gas industry.

At Jarrow flowline production to set targets ensures prompt delivery of overhead heaters and catering equipment to customers at all times.

Products, often tailormade to a customer's requirement, are being dealt with at the Coventry factory where there is a considerable pool of skilled labour. Meantime, development of new heaters and new products for the heating engineer is proceeding rapidly.

In the past Radiant Heating Ltd., has undertaken the design and development of prototypes to meet many requirements of industry and the industrial gas engineer. Unfortunately prototype work on its own often earns only marginal profits.

This problem has now been overcome and the profit declared at the annual general meeting in 1961 augurs a successful future for the company.

STATE WILL URGE FUELS TO COMPETE FOR CONSUMER'S SAKE

THE statement that the Government plans to foster more competition between the fuel industries to preserve freedom of choice for the consumer, was made by Mr. John George, Parliamentary Private Secretary to the Ministry of Power, at a conference of the Scottish members of the Women's Gas Federation in Glasgow.

Vigorous competition was a spur to efficiency and ensured that the consumer would not be exploited, he said.

Nationalisation had led to the creation of boards which were ' big business ' by any standards and which also were, by their nature, remote from the humble housewife who bought their products.

The image which had grown up in the minds of many, of powerful units so concerned with major issues that the individual counted for nothing, was wholly mistaken.

' Nationalisation must be successful, and success demands good public relations. You can help to remove the unfortunate image which lack of information has created,' he said.

Mr. Sydney Smith, Chairman of the Scottish Gas Board, said it was a matter of urgency that public opinion should be informed on the subject of gas. So long as people had old-fashioned ideas about the gas industry the whole fuel economy of Scotland would not be as good as it could be.

Since nationalisation 116 of the 195 small manufacturing stations in Scotland had been closed. Before long the gas plant at Westfield, together with the refinery gas supply at Grangemouth, would be supplying one-third of Scotland's needs, and the industry would be getting the benefit of its capital outlay.

These sources of supply would make gas cheaper, Mr. Smith said, but with the present inflationary economy it did not necessarily mean that the price of gas would be reduced. It did mean, however, that people who invested in gas now would get more and more value for their money.

The sale of domestic appliances was far lower than it should be. Too few housewives knew about the appliances and far greater efforts must be made to reach the customer in her home.

Other speakers included Mrs. L. W. Roberts, National Chairman of the Federation.

PERSONAL NOTES

MR. S. ASHWORTH has been appointed Production Engineer of the Mersey Group in succession to the late MR. T. W. PICKTHALL. His early training was with the Darwen (Lancs) Corporation Gas Department, where he subsequently became deputy engineer and general manager. He later transferred to the Leyland Gas Company and subsequently was appointed deputy engineer and general manager of the Aylesbury, Leighton Buzzard Group of Gas Companies. After nationalisation he became group production engineer to the Wirral Group, and on integration of the Wirral and Liverpool Groups he became deputy production engineer to the Mersey Group.

MR. N. V. CHAPMAN has been appointed Industrial Liaison Officer for engineering consumer goods of the Council of Industrial Design. He succeeds MR. H. UPJOHN, who has joined Berkeley Associates, design consultants. Mr. Chapman's responsibilities will include the CoID's contacts with manufacturers of gas heaters and cookers, refrigerators and ventilating appliances.

MR. M. CHANDLER, President of Northern Illinois Gas Company and its subsidiary, NI-Gas Supply, Inc., and a Vice-President of the American Gas Association, is the new Chairman of the Board of Trustees of the Institute of Gas Technology, affiliate of Illinois Institute of Technology, Chicago. He also becomes Chairman of the Board's executive committee.

COMING EVENTS

December 6.—I.G.E., EASTERN SECTION: London. Joint meeting with Eastern Juniors. 'The Background of Industrial Relations in the Gas Industry,' by A. B. Badger.

December 7. — NORTHERN JUNIORS: Newcastle. Joint meeting with North of England district section.

December 7.—SOUTH WESTERN G.C.C.: County Hotel, Taunton. 11 a.m.

December 9. — MANCHESTER DISTRICT JUNIORS: Manchester Industrial Development Centre. Short papers for F. Johnston Prize.

December 9. — SCOTTISH WESTERN JUNIORS: Albany Street, Social Club, Edinburgh. Joint meeting with East of Scotland Association. 3 p.m.

December 9. — YORKSHIRE JUNIORS: Sheffield. 'The Transmission and Control of Whitby Natural Gas,' by Mr. Cooper and Mr. Stephenson.

December 12. — MIDLAND JUNIORS: Short Paper Evening. Staff Mess Room, West Midland Gas Board, Birmingham District, Council House, Birmingham.

MR. J. W. RODGERS has been appointed Sales Manager (domestic sales) of the North Western Gas Board, MR. W. F. S. HOWELL has been appointed Technical Sales Manager, MR. R. A. W. HOLLINGDALE has been appointed Sales Manager (solid smokeless fuel), and MR. F. CRAVEN has been appointed Installations Manager. The Commercial Manager's Department will now cover all sales activities, and these changes will give greater co-ordination to these activities.

MR. H. A. PROBIN, controller, Kent and Sussex, has retired from the Board's service. All divisional officers in the Kent and Sussex divisions will be responsible directly to their chief officers at area headquarters. Mr. Probin has spent 32 years in the gas industry. He joined the Gas Light and Coke Company in 1929. At nationalisation Mr. Probin was appointed general manager, Kent County division, of the South Eastern Gas Board. He became controller, Kent and Sussex, in April, 1959.

MR. R. G. BAKER, Deputy Chairman, National Coal Board, has been elected President of the British Road Tar Association for 1961-62. MR. E. P. BUTLER, Chairman, Bristol & West Tar Distillers Ltd., and MR. R. N. BRUCE, Chairman, South Eastern Gas Board, are Vice-Presidents. MR. R. H. E. CLARK, Director, South Eastern Tar Distillers Ltd., is Honorary Treasurer, and MR. L. W. BLUNDELL, Controller of By-Products, North Thames Gas Board, is Chairman of council.

MR. G. B. R. FEILDEN is to join the Board of Davy-Ashmore Ltd. as Technical Director. Mr. Feilden will be based at the Group's London headquarters at 15, Portland Place, W.1, and will also be joining the Boards of the principal operating Companies of the Davy-Ashmore Group.

MR. C. MCINNES has been appointed conveyor belting Sales Manager of the North British Rubber Company. Mr. McInnes joined North British Rubber at the beginning of the year as field sales engineer. He will operate from the Industrial Products Sales Division at 62-64, Horseferry Road, London, S.W.1.

MR. J. CREEK is to succeed MR. A. H. DAVIES, O.B.E., as Managing Director of Fibreglass Ltd. Mr. Davies becomes Vice-Chairman of the Company.

MR. C. W. PAGE has been appointed Sales Manager of the Industrial Division of Castrol Industrial Ltd. This is a newly created post.

MR. H. KAY has been appointed Assistant Managing Director of the Engineering Division of Tube Investments.

TRADE NOTES

CHAMBERLAIN PLANT LTD., of Crown Works, Southbury Road, Enfield, Middlesex, has now moved into its new office building at Enfield. The new building, standing in front of the Company's works, showrooms and plant yards, brings under one roof the administrative and sales staff serving the Enfield, Haverfordwest and newly-opened Scunthorpe depots. Over £150,000 has been spent on the purchase of tracked excavators, mobile cranes, welding sets, fork lift trucks, mobile and portable compressors, dumpers, hoists, loading shovels and vibrating rollers to re-equip the company's hire fleet.

COPPUS ENGINEERING CORPORATION of Worcester, Mass., U.S.A., announces the appointment of **GEORGE MELLER LTD.**, 24, Fitzjohn's Avenue, London, N.W.3, as exclusive representatives in the U.K. Coppus Blue Ribbon turbines work equally well with steam, compressed air, natural gas or process gas as the power medium, and are qualified prime movers for direct connection to many types of pumps, blowers, fans, compressors, stokers, mixers and special machines. Coppus Blue Ribbon blowers are available as ventilators, exhausters and coolers.

ELLIOTT BROTHERS (LONDON) LTD., a member of the Elliott-Automation Group, announces that it is now able to supply the whole range of Datex analogue-digital converters and associated units, some of which are already in production under an exclusive licence from Giannini Ltd., the British affiliate of the Datex Corporation, Monrovia, U.S.A.

THE RAWLPLUG CO. LTD. has recently purchased additional freehold factory premises known as Brent Works, Colindale Avenue, Hendon, N.W.9. Owing to difficulties in obtaining permission for further extensions at the main Mill Hill Works, the Company has found it necessary to acquire this additional factory space.

STEWARTS AND LLOYDS LTD. recently opened a residential hall at Corby, Northants., for students employed by the Company. The hall, which has cost £150,000, will accommodate 65 students.

AMBUCO LTD. will install catalyst recovery cyclones at the Grangemouth Refinery during its next shutdown, scheduled for spring 1962. The order covers the supply of 12 cyclones.

THE AEROGRAPH-DeVILBISS CO. LTD. has had built new and larger factory and administration premises at West Howe, Bournemouth.